No. 637,461. Patented Nov. 21, 1899.

J. HARTNESS.

FLUID OPERATED LATHE.

(Application filed Jan. 11, 1899.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

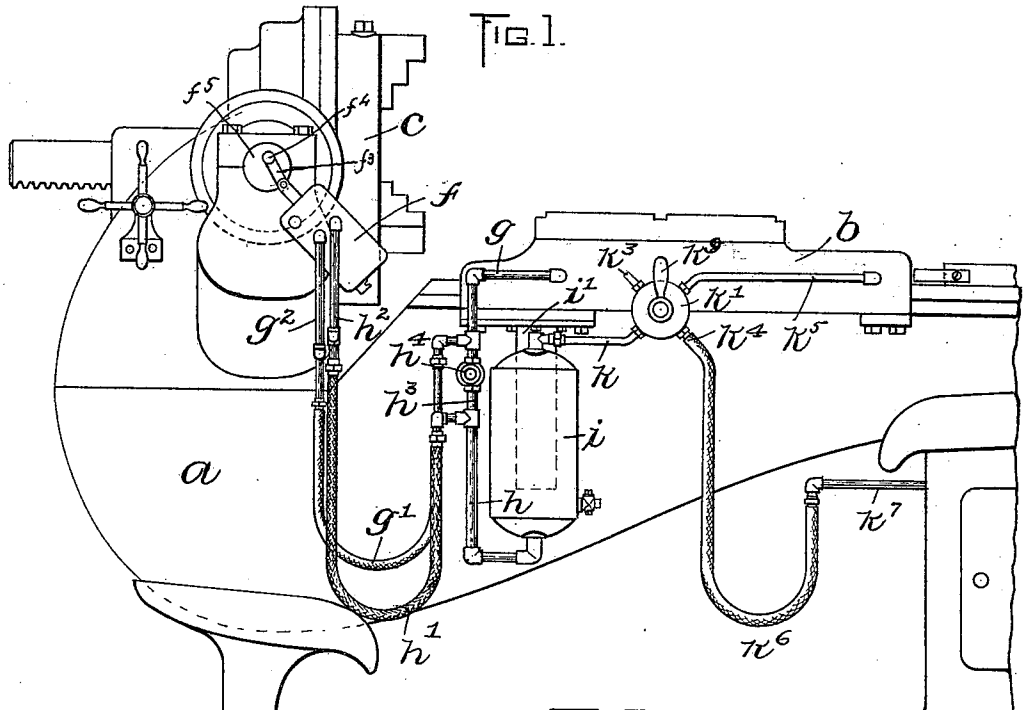
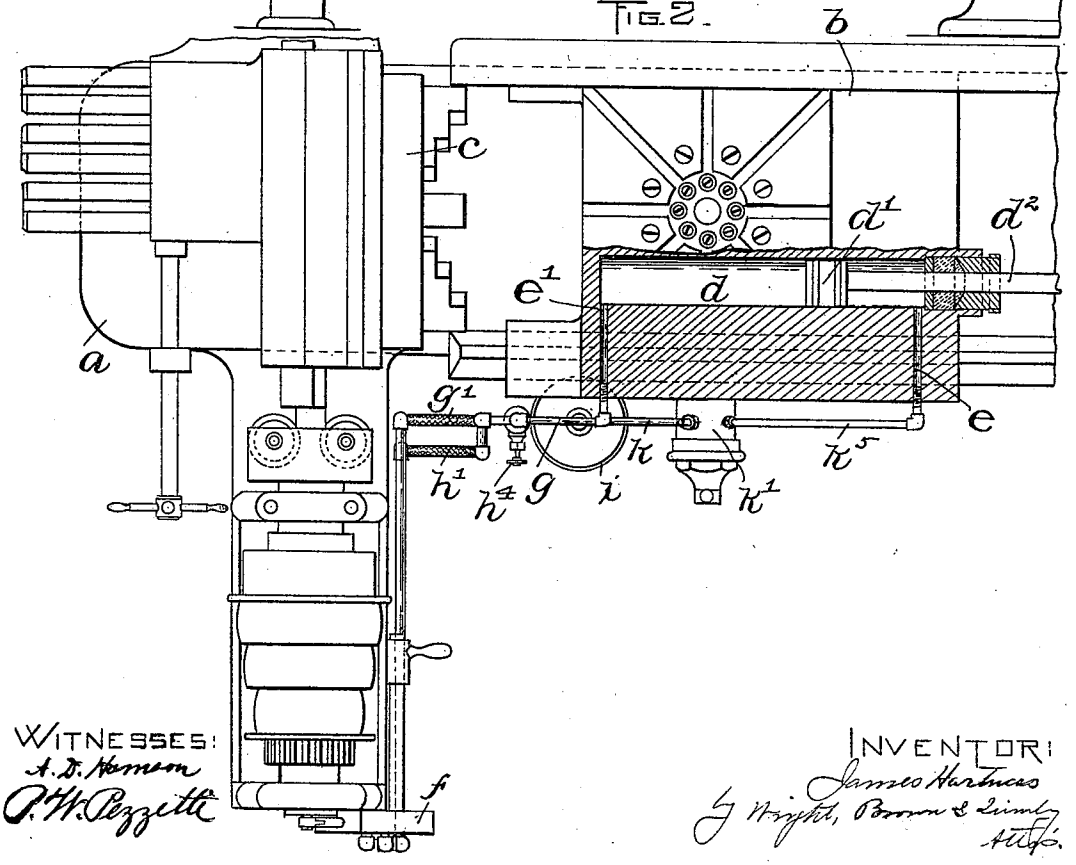


FIG. 2.



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FIG. 3.

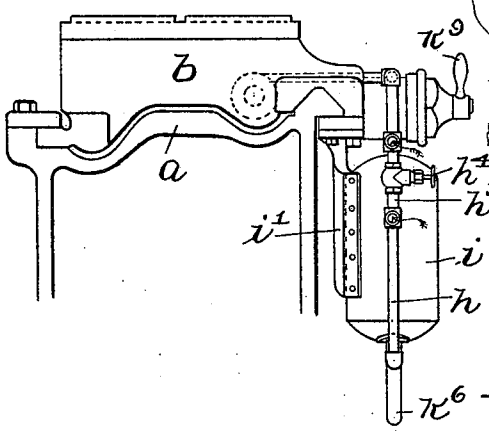


FIG. 5.

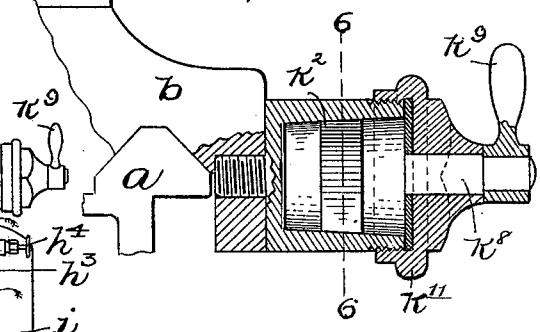


FIG. 4.

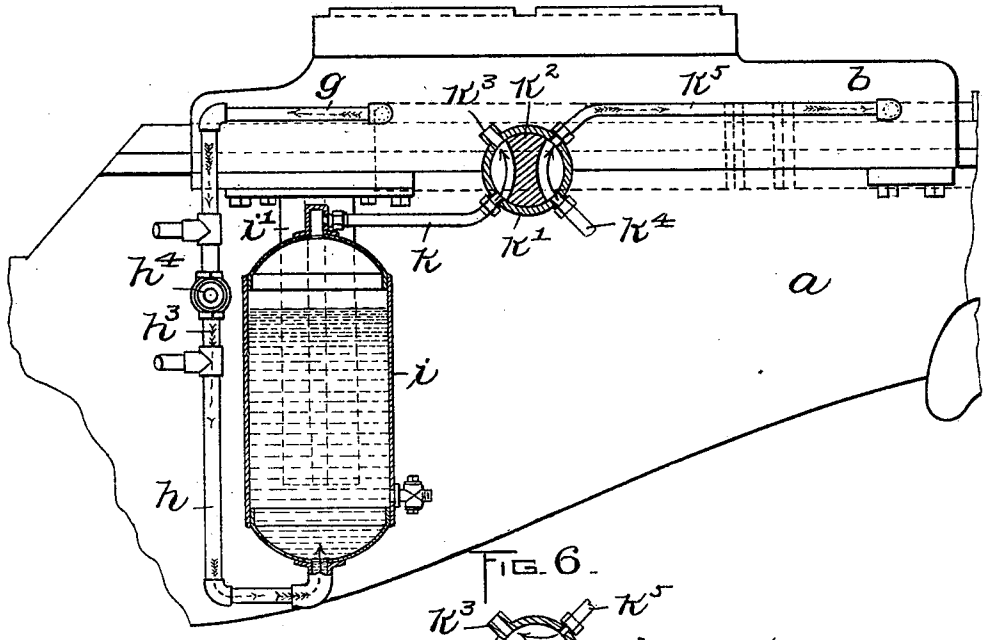
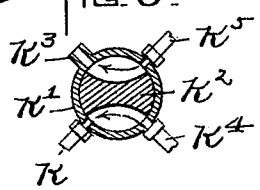


FIG. 6.



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No. 637,461. Patented Nov. 21, 1899.

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(No Model.) (Application filed Jan. 11, 1899.)

3 Sheets—Sheet 3.

Fig. 7.

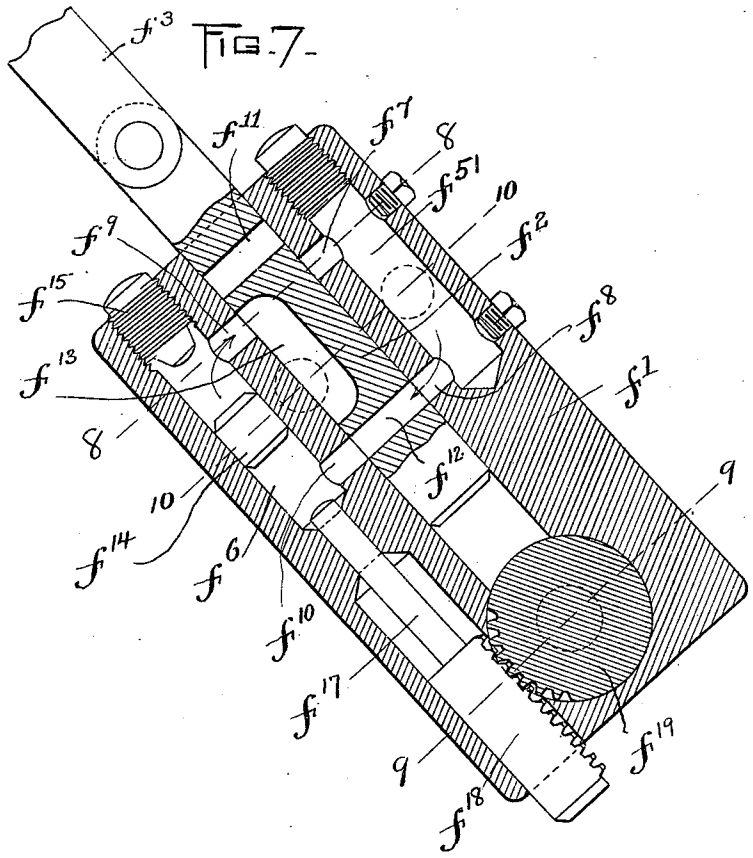


Fig 8

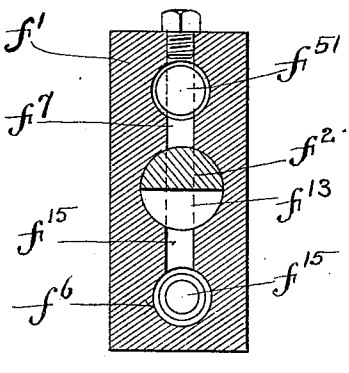


Fig 9

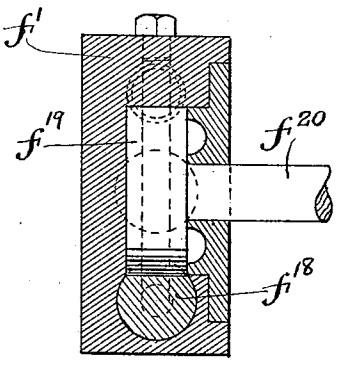
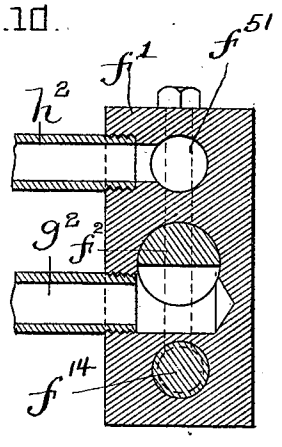


Fig. 10.



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UNITED STATES PATENT OFFICE.

JAMES HARTNESS, OF SPRINGFIELD, VERMONT.

FLUID-OPERATED LATHE.

SPECIFICATION forming part of Letters Patent No. 637,461, dated November 21, 1899.

Application filed January 11, 1899. Serial No. 701,814. (No model.)

To all whom it may concern:

Be it known that I, JAMES HARTNESS, of Springfield, in the county of Windsor and State of Vermont, have invented certain new and useful Improvements in Fluid-Operated Lathes, of which the following is a specification.

This invention has relation to fluid-operated devices—such as lathes, &c.—and while designed particularly for use on lathes such as that illustrated in my copending application, Serial No. 689,961, filed August 31, 1898, yet it may be equally well employed in connection with other mechanisms of different kinds wherein an element is moved by fluid-pressure.

Heretofore it has been attempted to feed the tool-holder in lathes in either of two different ways, one way being by means of liquid-pressure and the other being by elastic-fluid pressure, such as that produced by steam, gas, or air. Where liquid is used, however, it is more or less difficult to control, especially in large shops, where a large number of machines are operated, the liquid being frequently wasted and being liable to freeze in cold weather, and, on the other hand, where elastic-fluid or air pressure is used, although the air can be conducted quite easily to the machines and is easily controlled, yet the tool-holder is fed unevenly, is caused to move with jerks, and frequently causes breakage of the parts to such an extent as to practically prevent the use of compressed air.

This invention comprehends the employment of both elastic and inelastic fluids, whereby I am enabled to obtain the advantages due to the use of compressed air, which can be distributed to various parts of the shop, and am also enabled to gain the benefits due to the use of liquid.

The invention consists in a lathe possessing certain features of construction and relative arrangement of parts, all as illustrated upon the drawings now to be described in the accompanying specification and particularly pointed out in the claims hereunto appended.

Reference is to be had to the annexed drawings, and to the letters marked thereon, forming a part of this specification, the same letters designating the same parts or features, as the case may be, wherever they occur.

Of the drawings, Figure 1 represents in side elevation the front end of a lathe embodying my invention. Fig. 2 represents a plan view of the same, partially in section. Fig. 3 represents an end view of a portion of the bed of the tool-holder. Fig. 4 represents a side elevation, partially in section, the parts being somewhat enlarged to show the paths of the fluids. Figs. 5 and 6 represent sections through the valve, the two views being drawn to a different scale. Fig. 7 represents a longitudinal section through the escapement device which I employ for regulating the flow of the inelastic fluid to and from the cylinder. Figs. 8, 9, and 10 represent transverse sections on the lines 8 8, 9 9, and 10 10, respectively, of Fig. 7.

Referring to the drawings, a indicates the bed of a lathe, in which are mounted a sliding tool-holder b and the work-holder c, these parts being shown and described in detail in my said copending application hereinbefore referred to.

In the tool-holder or carriage b is formed a cylinder d, in which there is a piston d', mounted upon the end of a piston-rod d^2, the other end of said rod being rigidly secured to the end of the bed a, whereby when fluid is admitted to either side of the piston d' the carriage is moved toward or from the work, as the case may be. The port e leads into one end of the cylinder d on one side of the piston d' and the port e' leads into the port on the other side of the piston d'.

f indicates an escapement or regulating device for the fluid, such as shown and described in my said application, although any suitable escapement may be employed in its stead, and its object is to regulate the flow of liquid which passes through it. The port e' is connected by a pipe g, a flexible hose g', and a pipe g^2 with one part of the escapement, while the other portion of the escapement is connected by a pipe h^2, a flexible hose h', and a pipe h with the lower portion of a tank or reservoir i, which is supported by the carriage or tool-holder b and travels with it. As shown in Fig. 3, the tank is attached to a depending bracket i'. The tank or reservoir is air-tight and is adapted to be partially filled with inelastic fluid, such as water or oil. There is a by-pass h^3 between the pipe h and

the pipe g, so that instead of the fluid passing through the escapement f it may pass directly from one pipe to the other. A valve h^4 in the by-pass closes it when it is desired to have the fluid pass through the escapement or regulating device f.

k is a pipe which leads into the top of the reservoir i and which communicates with a four-way valve, said valve consisting of a casing k' and a rotatable valve member k^2, as shown in Figs. 4 and 6. Said valve-casing has a discharge-port k^3, an inlet leading into a pipe k^4, and a port which leads into a pipe k^5, whose end is connected to the port e. When the valve member k^2 is in the position shown in Fig. 4, it opens communication between the pipe k^4 and k^5 and the pipe k and the discharge-aperture k^3. The pipe k^4 communicates by a flexible hose k^6 with a pipe k^7, leading from a suitable air-pump, (not shown,) so that by turning the valve member into the position shown in Fig. 6 or in Fig. 4 air may be forced either into the tank i or into the rear end of the cylinder d, as the case may be. The valve member k^2 is connected to a valve-stem k^8, from which extends a handle k^9, said stem being passed through a cap a^{11}.

Referring to Figs. 7 to 10, inclusive, it will be seen that the escapement or device for regulating the supply of inelastic fluid to and from the cylinder consists of a casing f', having therein a slide-valve f^2, connected by a link f^3 with a crank f^4, projecting outwardly from a disk f^5 on the end of a shaft, which is mounted in the head-stock and which rotates the chuck. The main supply-pipe h^2 leads into a chamber f^{51} in the valve-casing on one side of the valve, there being a similar chamber f^6 on the other side of the valve. Extending inward from each of the chambers are ports f^7 f^8 f^9 f^{10}, the ports f^7 f^9 registering with each other and the ports f^8 f^{10} likewise registering at the other end of the chamber. The valve f^2 is provided with two transverse ports f^{11} f^{12}, the former being adapted to register with ports f^7 and f^9 and the latter with the ports f^8 f^{10} when the valve is at one or the other extreme of its movement to permit the passage of fluid from the main supply-pipe to the cylinder or chamber f^6. The valve f^2 is also provided with a duct f^{13} to register with either of the ducts f^9 f^{10} to conduct the exhaust liquid to the outlet g^2. The chamber f^6 is substantially cylindrical to receive a loose piston f^{14}, which is reciprocated by the fluid as the valve f^2 is moved forward and back. The piston and cylinder act as a measuring device or meter to limit the amount of fluid which passes through the casing independently of the initial pressure in the supply-pipe and the working resistance at the main cylinder. The volume of fluid may be increased or decreased by limiting the movement of the piston f^{14}, this being accomplished by the screw-stud f^{15} at one end of the cylinder and the pin f^{17} on the rack f^{18} at the other end of the cylinder. This rack may be moved by the partial pinion f^{19} on the shaft f^{20}, said shaft being provided with a handle (not shown) by which it may be rotated.

I do not herein broadly claim the escapement device nor its combination with a fluid-operating piston and cylinder, except as specifically set forth in the claims, since it is claimed in my applications Serial No. 696,770, filed November 18, 1898, and Serial No. 712,980, filed April 14, 1899.

The operation of the apparatus is as follows: When it is desired to feed the tool-holder forward or toward the work, the valve member k^2 is thrown to the position shown in Fig. 6 and the air is conducted through the pipes k^4 k into the upper portion of the tank or reservoir i. This forces the liquid in the tank through the pipe h, hose h', pipe h^2, escapement f, pipe g^2, hose g', and pipe g into the forward end of the cylinder d. The flow of the liquid is regulated by the escapement, so that the carriage is fed at any speed, as may be desired, it being usually necessary to advance the carriage slowly toward the work when the tool is in engagement therewith. To return the carriage to its original stopping-point, the valve h^4 is opened and the valve member k^2 is turned to the position shown in Fig. 4 to permit the air to pass from the pipe k^4 to the pipe k^5 into the rear end of the cylinder. As the carriage moves rapidly backward the liquid is forced out of the front end of the cylinder through the port and the pipe g, the by-pass h^3, and the pipe h into the lower end of the tank.

Thus it will be seen that I am enabled to use a small quantity of liquid, such as oil, (which will not freeze,) over and over again without any of it being wasted or escaping, and at the same time I am enabled to conduct the air from distant points to the machine without difficulty and to easily control it.

The elastic fluid forces the tool-holder in both directions by reason of its being deflected into the tank and cylinder alternately, and the inelastic fluid governs the movement of the holder and causes it to be fed smoothly and evenly. I have contemplated duplicating the inelastic-fluid mechanism, though for general purposes such a duplication is unnecessary.

I have shown the controlling-valve and the tank or reservoir as moving with the carriage; but it will be readily understood that they may be supported upon the bed and connected to the carriage by flexible hose-pipes, if desired.

Many other changes may be made in the apparatus shown without departing from the spirit and scope of the invention.

Having thus explained the nature of the invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I declare that what I claim is—

1. A fluid-operated mechanism comprising

a piston and cylinder, of which elements one is movable relatively to the other, means including a receptacle for delivering inelastic fluid into the cylinder to move the movable element in one direction, and means for delivering elastic fluid into the receptacle or into the cylinder, whereby said element is moved in either direction by elastic-fluid pressure and is controlled or governed by inelastic fluid.

2. A fluid-operated mechanism comprising a piston and cylinder, of which elements one is movable relatively to the other, and means for forcing the movable element in both directions alternately by elastic-fluid pressure, including a tank interposed between the source of elastic-fluid supply and the cylinder, and containing inelastic fluid, whereby said inelastic fluid controls or governs the movement of the movable element, and devices for conducting elastic fluid into said tank or to said cylinder.

3. A fluid-operated mechanism comprising a piston and cylinder, of which elements one is movable relatively to the other, a tank or reservoir for an inelastic fluid communicating with the cylinder on one side of said piston, a pipe leading from a source of elastic-fluid supply, and a valve mechanism for opening a communication alternately between said pipe and said tank and said pipe and said cylinder on the other side of said piston.

4. A fluid-operated mechanism comprising a piston and cylinder, of which elements one is movable relatively to the other, means for forcing the movable element in both directions by elastic-fluid pressure, a tank interposed between the source of elastic-fluid supply and the cylinder, and containing inelastic fluid, whereby said inelastic fluid controls or governs the movement of the movable element, devices for conducting elastic fluid into said tank or to said cylinder, and an escapement interposed between the tank and the cylinder to control the flow of the inelastic fluid.

5. A fluid-operated mechanism comprising a piston and cylinder of which elements one is movable relatively to the other, means for delivering inelastic fluid into one end of said cylinder to move the said element in one direction, means for delivering an elastic fluid into the other end of said cylinder to move said element in the opposite direction, and an escapement for controlling the passage of said inelastic fluid, into or out of the said cylinder.

6. A fluid-operated mechanism comprising a piston and cylinder of which elements one is movable relatively to the other, a tank or receptacle for an inelastic fluid, a conduit leading from the lower portion of said tank or receptacle to one end of said cylinder, a conduit leading from the upper portion of said tank or receptacle to the other end of said cylinder, and means for supplying elastic fluid to the tank to force the inelastic fluid into the cylinder or to the last-mentioned end of said cylinder to force the inelastic fluid back into the tank.

7. A fluid-operated mechanism comprising a piston and cylinder of which elements one is movable relatively to the other, a liquid tank or receptacle, a conduit leading from the lower portion of said tank or receptacle to one end of said cylinder, a valve-casing communicating with said tank or receptacle and with the other end of said cylinder, a conduit for conducting compressed air to said casing, and a valve in said casing for deflecting the air into the tank or into the cylinder.

8. A lathe comprising a tool-holder, a piston and cylinder for moving said holder, a tank or receptacle for inelastic fluid communicating with one end of said cylinder, a suitable source of elastic-fluid supply, a pipe leading into the other end of said cylinder, and means for conducting elastic fluid into said tank or receptacle or into said cylinder.

9. A fluid-operated mechanism comprising a piston and cylinder, of which elements one is movable relatively to the other, means including a receptacle communicating with said cylinder and adapted to contain a body of inelastic fluid, and means including a source of elastic-fluid supply and conduits leading therefrom to the cylinder and the receptacle for forcing the inelastic fluid from the receptacle into the cylinder or from the cylinder into the receptacle.

10. A lathe comprising a tool-holder and means for moving said holder, said means comprising a piston and cylinder, a liquid-tank, a conduit between said tank and one end of said cylinder, a liquid-escapement between the tank and the cylinder, a conduit between said tank and the other end of said cylinder, a four-way valve in said conduit, and a compressed-air pipe leading to said valve, said parts being constructed and arranged whereby elastic fluid is conducted to the tank or to the cylinder, and the inelastic fluid is conducted into the cylinder from the tank or from the cylinder into the tank.

In testimony whereof I have affixed my signature in presence of two witnesses.

JAMES HARTNESS.

Witnesses:
ERWIN L. GOLDSCHMIDT,
HENRY HASPER.